

***Application of Dominion Safety & Core Design  
Methods to Kewaunee Power Station (KPS)***

***Dominion Meeting with NRC Staff - 1/31/06***



## ***Dominion Meeting Participants***

- K. L. Basehore, Director-Nuclear Analysis & Fuel
- C. B. LaRoe, Supervisor-Nuclear Safety Analysis
- J. R. Harrell, Supervisor-Fuel Project Engineering
- J. T. Holly, Fuel Project Engineering [via phone]
- J. C. Lautzenheiser, Nuclear Safety Analysis
- G. L. Darden, Fuel Project Engineering
- C. D. Sly, Kewaunee Licensing Engineer

## ***Agenda***

- Meeting and Project Objectives
- Dominion Methods to Be Applied to KPS
- Applicability Assessment Methodology & Examples
- NSSS Accident Analysis Methodology Using RETRAN
- Regulatory Processes: Utility Topical Reports & COLR
- Proposed Submittals and Schedule
- Open Discussion/Action Items

## ***Meeting & Project Objectives***

- Meeting Objectives
  - Define technical and licensing details of approach for application of Dominion methods to Kewaunee
  - Obtain NRC feedback concerning: technical approach, licensing approach & schedule
  - Explore submittal & review options
- Project Objectives
  - Obtain NRC-approval for application of Dominion methods to Kewaunee
  - NRC approval target date of 1/31/08 for support of Cycle 29

## ***Overview of Proposed KPS COLR Changes***

- KPS COLR (prepared per TS 6.9.a.4) is maintained as Section 2.1 of KPS Technical Requirements Manual (TRM)
- KPS COLR contains current and legacy methodology references
- Dominion will retain W reference methods in COLR
  - represents current licensing basis & remains technically applicable
  - provides continuity during NRC review of Dominion methods
- Change TS 6.9.a.4 to add a 'bridge' topical DOM-NAF-5-A as reference methodology document for use of Dominion methods to establish COLR limits
- DOM-NAF-5-A will describe the specific approach and framework for use of Dominion methods for KPS.

***Key Elements of KPS Submittals  
to License Dominion Methods for KPS***

- Topical DOM-NAF-5 -- submit mid-2006
  - Statistical DNBR Statistical Design Limit quantification results
  - Detailed benchmark/validation analysis results
  - Detailed analysis results available for NRC review in audit meeting
- OR
- Submit DOM-NAF-5 Appendix A with detailed analysis
  - LAR to add DOM-NAF-5-A to COLR -- submit Jan 2007

## ***Dominion Methods to Be Applied to KPS***

- Core Physics Methods
  - VEP-FRD-42, Rev. 2.1-A [Reload Nuclear Design Methodology]
  - VEP-NE-1- Rev. 0.1-A [Relaxed Power Distribution Control]
  - DOM-NAF-1, Rev. 0.0-P-A [Core Management System (CMS) Reactor Physics]
  - VEP-FRD-45-A [Nuclear Design Reliability Factors]
  - VEP-FRD-36-A [Control Rod Worth Determination by Rod Swap Technique]
- Safety Analysis Methods
  - VEP-FRD-41-A [RETRAN NSSS Analysis]
  - VEP-NE-2-A [Statistical DNBR Evaluation Methodology]
  - DOM-NAF-2 [Core Thermal/Hydraulics Using VIPRE-D ] -- UNDER NRC REVIEW

## ***Applicability Assessment Screening Process***

- Description of each method, its purpose and key features and dependencies
  - key phenomena/conditions predicted by method
  - general calculational approach or assumptions
  - types of reactor conditions for which method is used
- Identify conditions & limitations associated with each method
  - regulatory limitations in NRC Safety Evaluation Reports (SERs)
  - physical limitations (e.g., plant systems, plant features & conditions)
  - limitations in Dominion topicals (e.g., specific modeling approaches or inherent assumptions)
- Assess each method with respect to conditions/limitations
  - effort will range from written evaluations (minor) to validation and/or benchmark analyses and detailed comparison of results (involved)



## ***Applicability Assessment Examples***

- Candidate Method: DOM-NAF-2 [VIPRE-D]
  - Evaluation of DOM-NAF-2 considered a minor effort
  - VIPRE-D is VIPRE-01 with minor modifications
    - Addition of proprietary vendor DNB correlations (e.g. WRB-1)
    - Minor input/output customizations
  - VIPRE-01 (with WRB-1) is the current DNB design basis tool for KPS
  - KPS 14x14 fuel, plant conditions & features are within the bounds defined in DOM-NAF-2
  - Conclusion: VIPRE-D is applicable to KPS for general DNB analysis, as defined in DOM-NAF-2

## ***Applicability Assessment Examples***

- **Candidate Method: DOM-NAF-1-A [CMS Reactor Physics]**
  - Evaluation of DOM-NAF-1 considered a moderate effort
  - DOM-NAF-1-A SER approved CMS as general core physics modeling methodology for application to Surry & North Anna
  - SER indicates additional NRC review may be warranted for application of DOM-NAF-1-A methods to a different fuel assembly lattice
  - Demonstration analyses will confirm applicability for analysis of KPS 14x14 fuel lattice in these specific areas (use multiple cycles of data)
    - Confirmation of Nuclear Reliability Factors (NRFs) applied to key parameter results from CMS (e.g., critical boron, ITC, rod worth)
    - CASMO vs. MCNP: peaking, flux instrument reaction rates
    - Comparison of SIMULATE & MCNP 2x2 assembly array predictions
  - Detailed analyses made available for NRC review
  - Conclusion: DOM-NAF-1-A is applicable to KPS

## ***Applicability Assessment Examples***

- Candidate Method: VEP-FRD-41-A [RETRAN NSSS Analysis]
  - Evaluation of VEP-FRD-41-A considered an involved effort
  - VEP-FRD-41-A SER approved RETRAN for use at Surry & North Anna, plants with 3-Loop Westinghouse NSSS
  - KPS fuel design & conditions are within bounds of VEP-FRD-41-A, but behavior of 2-Loop NSSS will be evaluated
  - KPS models developed in accordance with VEP-FRD-41-A & confirmed with selected benchmark analyses

## ***NSSS Accident Analysis Methodology Using RETRAN***

- VEP-FRD-41-A documents Dominion NSSS accident analysis methodology using RETRAN-02
- VEP- FRD-41-A methods are currently applied to SPS and NAPS UFSAR Non-LOCA transient analyses of record (AOR)
- RETRAN was approved for application to KPS NSSS accident analysis non-LOCA transients. [WPS report WPSRSEM-NP-A, Revision 3, Sep 2001]
- Westinghouse performed current USAR AOR for KPS non- LOCA transients using RETRAN-02. [Fuel Transition (Amendment 167, Apr 2003) and Stretch Uprate (Amendment 172, Feb 2004)]

*Conclusion: RETRAN-02 code is applicable to KPS--the key task involves demonstrating applicability of VEP-FRD-41-A methods*

## ***NSSS Accident Analysis Methodology Using RETRAN***

- These steps are established to demonstrate applicability of VEP-FRD-41-A methodologies to KPS
  - Define unique classes of events (RCS heatup; RCS cooldown/depressurization; reactivity excursion; loss of RCS flow; loss of secondary heat sink)
  - Select one or more events from each class, based on: 1) event complexity, 2) event establishing basis for key limits of operation, 3) event uniqueness relative to VEP-FRD-41 requirements
  - Perform demonstration analyses of identified events to validate capability to model key phenomena
  - Verify that applicability assessment criteria are met: 1) appropriate prediction of key phenomena, 2) predicted results are technically sound with reasonable agreement with USAR analyses and/or available plant data, 3) General trends in key parameters are consistent with USAR analyses
- Detailed analyses made available for NRC review

## ***NSSS Accident Analysis Methodology Using RETRAN - Candidate Events for Benchmark Analysis***

- **USAR 14.1.8, Locked Rotor**
  - criterion 1: complex event
  - criterion 3: 2-loop behavior more severe
- **USAR 14.1.10, Loss of Normal Feedwater**
  - criterion 2: establishes KPS auxiliary feedwater flow requirements
  - VEP-FRD-41 modeling verification (e.g., SG heat transfer)
- **USAR 14.2.5, Rupture of a Steam Pipe**
  - criteria 1 & 3: complex event, with potential for 2-loop behavior to be more severe
  - VEP-FRD-41 modeling verification (e.g. core inlet mixing)

## ***Regulatory Processes: Topicals & COLR***

- DOM-NAF-5 will document the 'bridge' to demonstrate applicability of Dominion methods to KPS
- Approval of DOM-NAF-5 and its addition to KPS COLR is the initial step in application of Dominion methods to KPS
- Subsequent steps will follow internal procedure & use provisions of 10CFR50.59 to modify separate Dominion topical reports
  - Include specific discussion in each topical to reflect the approved material and evaluations in DOM-NAF-5-A
  - Publish modified versions (mods) of each topical in accordance with Dominion procedure
  - Submit modified topicals to NRC for information
- This modification process is applied to all Dominion topicals that may be cited by reference in VEP-FRD-42 or in the COLR

## ***DOM-NAF-5 Submittal Content***

- The submittal requesting approval of DOM-NAF-5 will include
  - General discussion of application assessment process
  - Results of executing the assessment process for each Dominion method being applied to KPS
  - Commitments, as necessary, for subsequent evaluations or analyses to augment DOM-NAF-5

*DOM-NAF-5 submittal is scheduled to precede the LAR requesting its addition to the COLR to provide additional time for NRC review*



## ***Technical Specifications/COLR LAR Content***

- LAR for Technical Specifications/COLR change will include
  - General discussion of DOM-NAF-5 purpose and content (minimal content since DOM-NAF-5 will already have been submitted)
  - Request to add DOM-NAF-5-A as reference methodology to KPS Core Operating Limits Report (COLR), TS 6.9.a.4
  - Plant-specific application analysis to define DNBR Statistical Design Limit (SDL) per provisions of VEP-NE-2-A & DOM-NAF-2
  - DOM-NAF-5, Appendix A documenting detailed validation analyses, if needed

*Plant-specific application analysis (SDL) & LAR combined in one submittal so that LAR is complete and ready for NRC review*

## ***Proposed Submittals and Key Schedule Milestones***

- Dominion submits DOM-NAF-5 - 6/30/06
- Dominion submits LAR requesting DOM-NAF-5-A addition to KPS COLR - 1/31/07
- NRC issues SER for DOM-NAF-5-A - 9/30/07
- NRC issues SER for LAR - 1/31/08
- KPS Cycle 29 startup - Apr 2008

# ***Open Discussion & Action Items***